

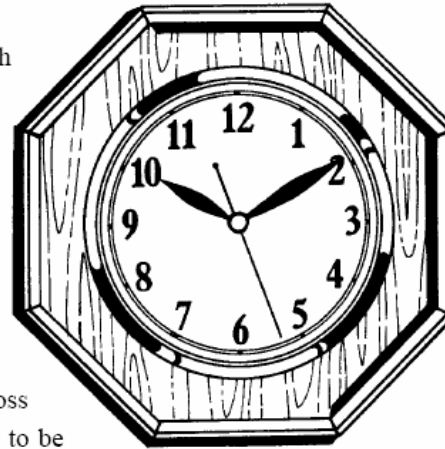
Reading—7th Released

Do you use dial or digital clocks? Isaac Asimov believes there are reasons to prefer one kind of clock to the other. Read why he is concerned about the use of digital clocks. Then answer the questions that follow.

Dial Versus Digital

Isaac Asimov

There seems no question but that the clock dial, which has existed in its present form since the seventeenth century and in earlier forms since ancient times, is on its way out. More and more common are the digital clocks that mark off the hours, minutes, and seconds in ever-changing numbers. This certainly appears to be an advance in technology. You will no longer have to interpret the meaning of “the big hand on the eleven and the little hand on the five.” Your digital clock will tell you at once that it is 4:55. And yet there will be a loss in the conversion of dial to digital, and no one seems to be worrying about it.



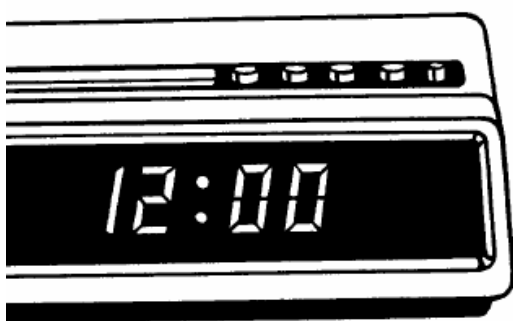
When something turns, it can turn in just one of two ways, clockwise or counterclockwise, and we all know which is which. Clockwise is the normal turning direction of the hands of a clock and counterclockwise is the opposite of that. Since we all stare at clocks (dial clocks, that is), we have no trouble following directions or descriptions that include those words. But if dial clocks disappear, so will the meaning of those words for anyone who has never stared at anything but digitals. There are no *good* substitutes for clockwise and counterclockwise. The nearest you can come is by a consideration of your hands. If you clench your fists with your thumbs pointing at your chest and then look at your fingers, you will see that the fingers of your right hand curve counterclockwise from knuckles to tips while the fingers of your left hand curve clockwise. You could then talk about a “right-hand twist” and a “left-hand twist,” but people don’t stare at their hands the way they stare at a clock, and this will never be an adequate replacement.

Nor is this a minor matter. Astronomers define the north pole and south pole of any rotating body in such terms. If you are hovering above a pole of rotation and the body is rotating counterclockwise, it is the north pole; if the body is rotating clockwise, it is the south pole. Astronomers also speak of “direct motion” and “retrograde motion,” by which they mean counterclockwise and clockwise, respectively.

Here is another example. Suppose you are looking through a microscope at some object on a slide or through a telescope at some view in the sky. In either case, you might wish to point out something to a colleague and ask him or her to look at it, too. “Notice that object

at eleven o'clock," you might say—or five o'clock or two o'clock. Everyone knows exactly where two, five, or eleven—or any number from one to twelve—is located on the clock dial, and can immediately look exactly where he is told. (In combat, pilots may call attention to the approach of an enemy plane or the location of antiaircraft bursts or the target, for that matter, in the same way.)

Once the dial is gone, location by "o'clock" will also be gone, and we have nothing



to take its place. Of course, you can use directions instead: "northeast," "southwest by south," and so on. However, you will have to know which direction is north to begin with. Or, if you are arbitrary and decide to let north be straight ahead or straight up, regardless of its real location, it still remains true that very few people are as familiar with a compass as with a clock face.

Here's still another thing. Children learn to count and once they learn the first few numbers, they quickly get the whole idea. You go from 0 to 9, and 0 to 9, over and over again. You go from 0 to 9, then from 10 to 19, then from 20 to 29, and so on till you reach 90 to 99, and then you pass on to 100. It is a very systematic thing and once you learn it, you never forget it. Time is different! The early Sumerians couldn't handle fractions very well, so they chose 60 as their base because it can be divided evenly in a number of ways. Ever since, we have continued to use the number 60 in certain applications, the chief one being the measurement of time. Thus, there are 60 minutes in an hour.

If you are using a dial, this doesn't matter. You simply note the position of the hands and they automatically become a measure of time: "half past five," "a quarter past three," "a quarter to ten," and so on. You see time as space and not as numbers. In a digital clock, however, time is measured *only* as numbers, so you go from 1:01 to 1:59 and then move directly to 2:00. It introduces an irregularity into the number system that is going to insert a stumbling block, and an unnecessary one, into education. Just think: 5.50 is halfway between 5 and 6 if we are measuring length or weight or money or anything but time. In time, 5:50 is nearly 6, and it is 5:30 that is halfway between 5 and 6.

What shall we do about all this? I can think of nothing. There is an odd conservatism among people that will make them fight to the death against making time decimal and having a hundred minutes to the hour. And even if we do convert to decimal time, what will we do about "clockwise," "counterclockwise," and locating things at "eleven o'clock"? It will be a pretty problem for our descendants.

11. The Sumerians chose 60 as the base for their number system because
- A. there are 60 minutes in an hour.
 - B. they invented dial clocks.
 - C. **60 can be divided easily.**
 - D. there were six sacred directions on the Sumerian compass.

This is a DOK 1 because it requires locating/recalling information. CCA 2.4

12. The author says that using dial references when viewing objects under a microscope helps to show the
- A. **position of an object.**
 - B. time that the object is observed.
 - C. frequency of appearance of the object.
 - D. duration of time that the object is evident.

This is a DOK 2 because students have to make inter-sentence inferences to find the answer, and it requires comprehension and processing of information. CCA 2.7

13. Which feature of a dial clock do astronomers use to define Earth's rotation?
- A. its numbering system
 - B. **its direction of hand movement**
 - C. its relationship to a compass
 - D. its movement over time

This is a DOK 2 because students have to make inter-sentence inferences to find the answer, and it requires comprehension and processing of information. CCA 2.7

14. The author concludes that in the future
- A. only scientists will use dial clocks.
 - B. new clock terms will be invented.
 - C. **the clock problem will continue.**
 - D. children will learn to count differently.

This is a DOK 1 because the answer is directly in the text. CCA 2.4

Open Response

Discuss **three** arguments that the author uses in trying to convince the reader that dial clocks are better than digital clocks.

This is a DOK 2. The answer is in the text, but students have to paraphrase to answer. "Discuss" is not a verb used in CCA Version 4; might use "Explain" instead. CCA 3.4